

Response under 37 C.F.R. §1.111  
Application No. 10/692,722  
Attorney Docket No. 032045

### **REMARKS**

Claims 1-2, 4-12, 14-17, 19 and 21-30 are pending in the present application. Claims 29-30 have been added herein. Support for the new claims is found at page 8, lines 15-17.

#### **Applicant's Response to the Claim Rejections under 35 U.S.C. §102(e):**

Claims 27-28 are rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,579,808 (Cho et al., hereinafter referred to as Cho). Applicants respectfully traverse. The rejection is a recitation of the rejection made to claims 1-2, 4-6, 9-12, 14, 17, 19 and 21-22 in the Office Action of August 10, 2006. This rejection relies on Cho's disclosure of He. However, claims 27 and 28 do not recite He as a first gas. Hence, Cho does not teach each and every element of the claimed invention. Specifically, Cho does not teach the limitation of claims 27 and 28 that the etch gas is comprised of SO<sub>2</sub> and at least one of Ne, Ar, Xe, Kr, CO, CO<sub>2</sub> or N<sub>2</sub>. Wherefore, applicants respectfully request favorable reconsideration.

#### **Applicant's Response to the Claim Rejections under 35 U.S.C. §103(a):**

Claims 1-2, 4-6, 9-12, 14, 17, 19 and 21-22 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,579,808 (Cho) in view of U.S. Patent No. 6,110,826 (Lou et al., hereinafter referred to as Lou). Applicants respectfully traverse. The Office maintains that Lou discloses both the use of O<sub>2</sub> in the etch gas and the claimed flow rate, and that it would be

obvious to the skilled artisan to incorporate the O<sub>2</sub> and flow rate of Lou into the etch gas of Cho. Specifically, page 4, lines 12-15 of the Office Action states that Lou “discloses that after the image formation of the line trench in the photoresist layer, a plasma etch is performed on the exposed photoresist using etch gases such as O<sub>2</sub>, SO<sub>2</sub> and He in the claimed flow rate, so as to continue the etch process until the etch stop layer is reached while forming a line trench in the underlayer.” This statement of motivation appears to only be a recitation of the utility of the etch gas of Lou. The Office does not explain how this etch process applies to the etch characteristics needed to obtain the etching required by Cho.

Under U.S. patent law, in order to maintain a *prima facie* case of obviousness under 35 U.S.C. §103, there must be a teaching or suggestion which motivates the skilled artisan to make the combination. The references must be considered as a whole and disclosures which teach away from the combination must also be considered. In view of these standards of law, there is no motivation to use the etch gas of Lou for the device of Cho. Further, Cho teaches away from the use of O<sub>2</sub> in the etch gas.

First, the skilled artisan would not expect or consider similar results for etching of different materials as taught by Cho and Lou. Cho, as illustrated in Fig. 3B, teaches that the Anti-Reflective Coating layer 206(207) is etched using SO<sub>2</sub> and He as an etch gas. The Anti-Reflective Coating layer 206 is formed with organic materials. See col. 3, lines 28-30. Contrary, in Lou, the IMD layer 300 is etched using O<sub>2</sub>, He, SO<sub>2</sub> and CF<sub>4</sub> as an etch gas. See col. 6, lines

1-8. The IMD layer 300 is made of phosphosilicate glas (PSG) or silicon oxide. See col. 5, lines 55-64. Hence, the materials to be etched in Cho and in Lou are distinct.

Second, the purpose of the etch gas of Cho is unique and contrary to the teachings of Lou. Cho teaches that the use of SO<sub>2</sub>/He to etch the anti-reflective coating layer 206 results in the formation of a polymer as side walls 210. Col. 3, lines 62-67. This polymer side wall narrows the intended contact hole side from the original dimensions of the photoresist a2 (col. 3, lines 49-53) to the distance between the polymer side walls 210, b2. See col. 4, lines 1-4. Cho teaches that the primary advantage of the SO<sub>2</sub>/He mixture is this polymer formation to narrow the contact hole dimensions. Further, Cho states that:

...SO<sub>2</sub> has a reactivity lower than that of the O<sub>2</sub> gas. The SO<sub>2</sub> gas has no lateral etch properties, and thereby generates polymer due to reaction with etch floating particles. The polymer is attached to the exposed side of the remaining Anti-Reflective Coating layer to form a polymer sidewall...

Col. 3, lines 62-67.

Contrary, the etch gas of Lou, cited by the Office, is to etch an intermetal dielectric layer 300 and etch stop layer 250 for a duel damascene formation. See col. 5, line 56 to col. 6, line 15. There is no teaching or suggestion in Lou which would lead the skilled artisan to believe that including O<sub>2</sub> and the flow rates in the etch gas of Cho would result in an etch gas which would obtain the necessary polymer build up required by Cho. Rather, Cho states that O<sub>2</sub> is too reactive and would laterally etch the sidewalls resulting in an etched opening which does not have the narrower characteristics desired for Cho's invention. Hence, there is no motivation to combine the references. Rather, the etch procedures of Cho and Lou are completely different, and Cho

Response under 37 C.F.R. §1.111  
Application No. 10/692,722  
Attorney Docket No. 032045

teaches away from the inclusion of O<sub>2</sub> in the etch gas. Wherefore, applicants' respectfully request favorable reconsideration.

Claims 7-8 and 15-16 are rejected under 35 U.S.C. §103(a) as being unpatentable over Cho in view of Lou as applied to claims 1-2, 4-6, 9-12, 14, 17, 19 and 21-22, above and further in view of U.S. Patent No. 6,187,688 (Ohkuni et al.). Also, Claims 23-26 are rejected under 35 U.S.C. §103(a) as being unpatentable over Cho in view of Lou as applied to claims 1-2, 4-6, 9-12, 14, 17, 19 and 21-22, above and further in view of U.S. Patent No. 2003/0134231 (Tsai et al.). As these rejections depend in part on the rejection of the claims based on the combination of Cho and Lou, applicants respectfully submit that by addressing the rejection as detailed above, the rejection of claims 7-8, 15-16 and 23-26 are likewise addressed.

In view of the above remarks, Applicants submit that the claims, as herein presented, are in condition for allowance. Applicants request such action at an early date.

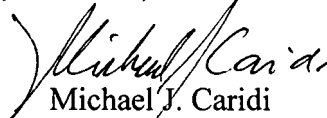
If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

Response under 37 C.F.R. §1.111  
Application No. 10/692,722  
Attorney Docket No. 032045

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

**WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP**

  
Michael J. Caridi  
Attorney for Applicants  
Registration No. 56,171  
Telephone: (202) 822-1100  
Facsimile: (202) 822-1111

MJC/af